UNPUBLISHED
RESEARCH
REPORTS

INTERMOUNTAIN STATION
Central Reference File
No. 3.4191

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

Project | Date | Author

TITLE

OBSERVATIONS ON CHRISTMAS TREE BLIGHT IN NORTHWESTERN MONTANA SEASON OF 1947-48

By
Philip C. Johnson
Entomologist

Forest Insect Laboratory
Coeur d'Alene, Idaho
January 25, 1949

FILE COPY
MISSOULA
FOREST INSECT
LABORATORY

SUBJECT—

INDEX NO.—

U. S. GOVERNMENT PRINTING OFFICE 16—47272-1

OBSERVATIONS ON CHRISTMAS TREE BLIGHT IN NORTHWESTERN MONTANA

Season of 1947-48

INTRODUCTION

Lincoln and Flathead Counties in northwestern Montana comprise one of the leading Douglas fir Christmas tree producing areas in the United States. Trees from these counties command premium prices because of their dense, delicate foliage, short internodes, and excellent shape. The annual harvest of trees has become a major business, giving two months of employment to hundreds of persons engaged in cutting, hauling, grading, baling and shipping trees. Communities like Eureka have become dependent upon this industry for a large share of their annual income.

In 1947 the cut of Christmas trees was reduced almost 25 percent by the widespread discoloration and defoliation of the current needle growth. This reduction, due almost directly to the blight, is shown in the following tabulation[1/]:

Montana Christmas Trees Shipped

County	1946	1947	Ratio: 1947/1946, %
Lincoln	1,368,400	1,032,000	-24.6
Flathead	1,224,000	1,046,250	-14.5
All others*	707,000	437,390	-38.1
TOTALS	3,299,400	2,515,640	-23.7

(*) Principally Lake, Sanders, Missoula, Granite, Ravalli, Mineral, and Powell.

This curtailment was of economic importance not only to individual growers and cutters, but to large wholesalers who maintain extensive collection and grading yards and to the railroads which, in 1947, carried 88 percent of Montana's Christmas trees to 31 States, and to other transportation carriers. One railroad reported that their Christmas tree shipments in Montana were reduced from 470 carloads in 1946 to 379 in 1947.

1/ Dickerman, M. B. 1948. Christmas tree shipments drop 24 percent. Research Note No. 53. Northern Rocky Mountain Forest and Range Experiment Station, Forest Service, Missoula, Montana. Processed.

The full effect of the blight was not apparent until harvesting operations were begun in 1947. Buyers and cutters working in the woods soon found that needle discoloration and defoliation was so great that whole areas had to be abandoned. Thousands of trees which had been cut, sorted and even baled for shipment suddenly lost their needles. There was naturally much concern over the cause of the damage and its total effect upon the harvest. Many requests for information as to the causal agency and its control were received by the various forestry agencies operating in the northern Rockies. Representatives 1/ of these agencies working together soon established the presence of several factors which could have been responsible for the damage to the trees. These included a needle disease, two insects, a spider mite, and certain climatic conditions which existed prior to and during the tree harvest period. A description of each of these factors and a discussion of their potential damage and control possibilities was made the subject of a publication in July 1948 by the Northern Rocky Mountain Forest and Range 2/.

1/ Arthur L. Roe, Silviculturist, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Montana; G. R. DeJarnette, Forester, Regional Office, Forest Service, Missoula; Howard Ahlgren, Timber Management Staff Assistant, Kootenai National Forest, Libby, Montana; Ernest Crumbo and E. Kenmyler Albert, District Rangers, Kootenai National Forest, Rexford and Fortine, Montana, respectively; Thomas W. Childs, Pathologist, Office of Forest Pathology, Bureau of Plant Industry, Soils, and Agricultural Engineering, Portland, Oregon; Philip J. Salisbury, Pathologist, Dominion Department of Agriculture, Victoria, B. C.; C. H. Waters, Professor of Pathology, Montana State University, Missoula; W. S. Matthew, Forestry Specialist, Soil Conservation Service, Thompson Falls, Montana; James C. Evenden and the writer, Entomologists, Forest Insect Laboratory, Bureau of Entomology and Plant Quarantine, Coeur d'Alene, Idaho.

2/ Roe, Arthur L. 1948. What caused "blight" on Christmas trees in the northern Rockies in 1947? Research Note No. 65. Northern Rocky Mountain Forest and Range Experiment Station, Forest Service, Missoula, Montana. Processed.

In conjunction with other assignments the writer had an opportunity during the 1948 summer and autumn months to make periodic visits to Christmas tree producing areas in parts of western Montana, principally in Lincoln County. The purpose of these visits was to observe the development of insect and mite populations to find how much needle damage could be attributed to the organisms directly. The observations were concluded with an examination of Christmas tree stock being harvested in the Rexford and Eureka area during November. At this time it was possible to evaluate the effect of insect and mite activity during 1948 as well as from the Rhabdocline blight and climate. The latter are not strictly within the province of this report, but they are discussed briefly to complete a picture of conditions affecting the 1948 tree harvest.

INSECT DEVELOPMENT IN 1948

Cooley Gall Louse

During the 1947 Christmas tree harvest period, an examination of twigs and branches shipped or brought to the Coeur d'Alene laboratory revealed active populations of the Cooley gall louse, Adelges (Chermes) cooleyi Gill. on the needles. Some branches were relatively free of insects, while others harbored light to moderately heavy infestations. Some of the injured needles were splotched with yellow, while others were more uniformly faded. Many had the characteristic crooked axis associated with the feeding punctures of the spruce gall louse. While this insect was responsible for some damage, this type of injury could not be segregated from the discoloration of the needle caused by the Douglas fir needle cast, Rhabdocline pseudotsugae Syd.

In the spring of 1948 it was possible to check these observations with field examinations throughout the Rexford-Eureka district. As the 1948 Douglas Fir buds opened during the latter part of June, heavy louse populations soon settled on the new needles. In some instances the newly hatched lice literally swarmed on the new buds before they had fully opened. As many as 50 were counted on the needles of a single bud, while they were still held together with the bud cap.

By the middle of July the young lice had matured and their number was materially reduced with the departure of the winged females to stands of Engelmann spruce, their summer host. The wingless or apterious females which remained on the Douglas fir 1948 needle growth did not appear to be numerous enough, even in areas where the population was heaviest, to cause much damage. In the more heavily infested areas the needles did not all bear feeding punctures and few had more than two or three. Most of the needles infested showed the characteristic small yellowing at the puncture, but the needles as a whole remained green until late summer. At this time yellowish- to reddish-brown spots indicative of Rhabdocline infections began to appear.

In many parts of northwestern Montana the 1948 needle growth began to turn a sickly yellow toward the end of September and this condition grew steadily worse through October and November. Many of the needles had fallen by this time to give the trees much of the appearance they had the year previous.

Though the louse populations were correspondingly heavy in a number of areas observed during 1948, needle discoloration and defoliation occurred only in places where there was evident Rhabdocline infection. This seems to indicate that needle damage from louse activity was negligible this year. This could have been due to uneven distribution of the population, heavy natural mortality, or to the competition offered by the needle blight. With the blight so abundant many of the overwintering stem mothers may have been destroyed or rendered ineffective by displacement as a result of the louse-infested needles dropping because of the action of blight infections induced in 1947. It does not appear likely that any action of the louse could effectively prevent establishment of a successful blight infection, but, on the other hand, establishment of the blight simultaneously with a louse infestation could conceivably interfere with the successful development of the latter, either by the method just mentioned or by causing the needles to become unpalatable.

Pine Needle Scale, Spider Mites

Numerous field examinations in 1948 failed to reveal significantly important populations of the pine needle scale, Phenacaspis pinifoliae Fitch., or of spider mites, Paratetranychus sp. Both appeared far less numerous than when found on infested foliage submitted to the laboratory in November 1947. It is highly possible that spider mite populations were held in check during 1948 by an abnormally wet spring and summer season (Table 1). The effect of climate in regulating spider mite infestations on Douglas fir in the northern Rockies has not been established, but long, hot, dry summers are known to have encourage aggressive infestations of these tiny arachnids in shade trees in California. If this is true then abnormally wet summers might easily prevent or retard mite population build-ups.

Table 1. Monthly summer rainfall, Fortine, Montana

Month	Inches	Departure from Normal
April	1.97	+ 0.98
May	2.50	+ 0.46
June	3.57	+ 1.24
July	3.96	+ 2.79
August	1.34	+ 0.06
TOTAL	13.04	+ 2.04

RHABDOCLINE IN 1948

Some observations on the 1948 occurrence of needle blight fungus are included here because of the association between it and the insects and mites discussed above. These are based solely upon an interpretation of the damage as it developed at several points in Lincoln, Flathead, and Sanders Counties during the season and as it appeared at harvest time in October and November. The more important are listed as follows:

1. In areas where blight damage occurred both in 1947 and 1948 the damage in 1948 seemed to be as great or, in some cases, greater, than that which occurred the previous year. Seldom was it less.

2. Light to moderate damage was observed in some localities where no previous damage had occurred. This was particularly true in the Tobacco River watershed south of Eureka.

3. Some individual trees, purposely selected in May 1948 for their supposed blight resistance, were infected severely enough to show appreciable needle damage. Others continued to show resistance to the disease.

4. Judged from its damage, the blight was not uniformly distributed through the Christmas tree producing areas. Many stands undamaged in 1948 were interspersed with stands damaged severely enough to cut down their potential yield of Christmas trees.

5. As predicted by Dr. Thomas W. Childs, Pathologist, Bureau of Plant Industry, Soils, and Agricultural Engineering, an extremely wet June apparently was responsible for the widespread prevalence and severity of the blight in 1948. The 3.57 inches of rain which fell was more or less evenly distributed through the entire month. Coming at a time when the fructifications were mature the rain assisted the dispersal of the ascospores, according to Dr. Childs. The occurrence of abnormal rains during this period undoubtedly was mainly responsible for the foothold gained by the blight in 1947 and 1948. Both Dr. Childs and Dr. C. W. Waters, Professor of Pathology, Montana State University, have expressed the opinion that the blight may continue to flourish so long as these abnormally wet springs persist.

1948 CHRISTMAS TREE HARVEST

Conversations with a number of Christmas tree cutters and stumpage owners in various parts of western Montana disclosed that harvesting operations in 1948 were not seriously affected by the blight or from insect or mite work. The same situation was also

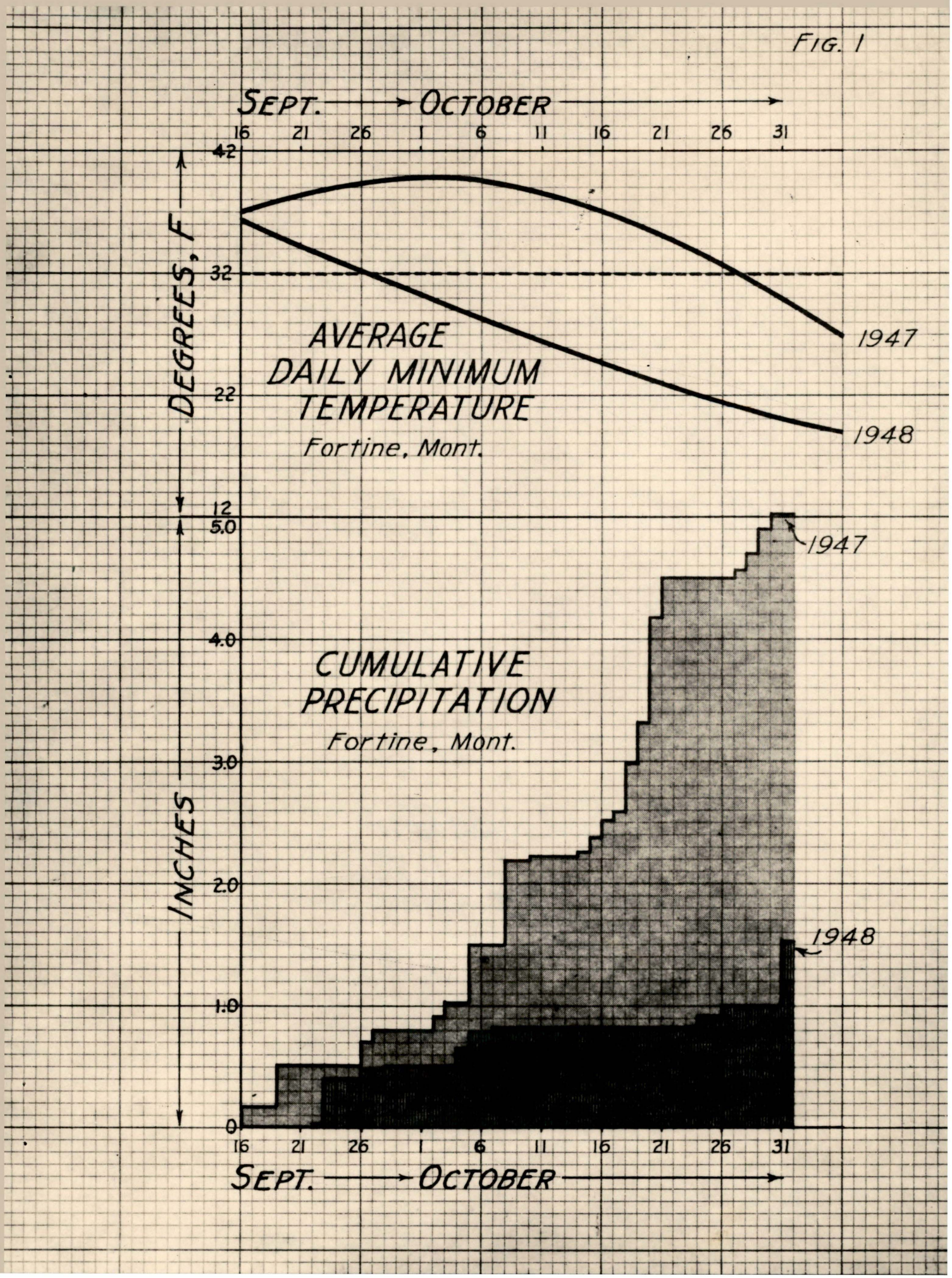
reported recently in correspondence received from Mr. L. S. Matthew, Forestry Specialist, Soil Conservation Service, Thompson Falls, Montana. Despite heavy discoloration and some defoliation of the 1948 needle growth in many areas good trees were put on the market in ample quantities. This was due, it is believed, to the concentration of cutting in blight-free areas and, as Mr. Matthew points out, to careful individual tree selection in blighted areas.

Very little damage occurred after the trees were cut this year in contrast to a considerable amount in 1947. This presumably resulted from a later cutting season and to more favorable climatic conditions in 1948. Last year, for instance, cutting began in September, much earlier than usual. This might not have been detrimental in itself if unfavorable weather had not followed. Many operators are of the opinion that maximum needle retention after cutting is not secured until the trees have undergone certain physiological processes which prepare them for dormancy during the cold winters. They contend that cutting should be delayed until frosty weather has arrived, usually late in September. As shown in Figure 1 the 1947 average daily minimum air temperatures at Fortine, Montana, 11 miles south of Eureka, did not reach freezing until October 27, or approximately 4 to 5 weeks after cutting had begun. Unusually warm weather in September and October may have delayed tree dormancy and this may have accounted for excessive loss of needles after cutting in 1947. In contrast to this, no needle loss was experienced after the 1948 cuttings. These, for the most part, were not started until the first of October well after frost had set in (Fig.1).

A more plausible reason for the excessive needle drop in 1947 was the combination of warm weather and abnormal precipitation. Referring again to Fig. 1, a total of 5.02 inches of rain fell in the Eureka area (record from Fortine) between September 16 and November 1, 1947. Rain fell on 21 of the 46 days in this period. The constant wetting of the foliage, coupled with unseasonable warm temperatures, was believed responsible for the mildewing of the needles of many stacked and baled Christmas trees awaiting shipment. The loss of needles from this cause was far greater than that caused by any of the other needle-damaging factors already discussed.

There was little or no needle loss after cutting in 1948. While careful selection of blight-free trees in the woods may have accounted for some of this it is believed due primarily to the earlier advent of frosty weather and more normal seasonal precipitation (Fig. 1) which prevented mildewing.

FIG. 1


SEPT. → OCTOBER
16 21 26 1 6 11 16 21 26 31
DEGREES, F
42
32
22
12
AVERAGE DAILY MINIMUM TEMPERATURE
Fortine, Mont.
1947
1948
INCHES
5.0
4.0
3.0
2.0
1.0
0
CUMULATIVE PRECIPITATION
Fortine, Mont.
1947
1948
16 21 26 1 6 11 16 21 26 31
SEPT. → OCTOBER

CONCLUSIONS

From all indications infestations of Cooley's gall louse, the pine needle scale, and spider mites were not serious enough in western Montana during 1947 and 1948 to have caused significant damage to the foliage of Douglas fir Christmas tree stock. On the basis of what has happened during these years it would seem that the natural factors which encourage Rhabdocline infection, possibly an over-abundance of rain in the early summer months, tend to suppress infestations of these three organisms. There is also reason to believe that the mere presence of the Rhabdocline infections may cause the needles to be unpalatable as host material. Whether or not there exists any relationship between the blight and the insects or mites cannot be definitely established without more detailed evidence.

Fig. 1A(left). Douglas fir lateral twig showing heavy defoliation of 1947 needles caused primarily by the needle blight fungus, Rhabdocline pseudotsugae Syd. Note 1948 buds as they appeared May 28, 1948. (1322)

Fig. 2 (right). Typical blighted Douglas fir Christmas tree from Rexford-Eureka district showing heavy damage to top and lateral leaders from loss of 1947 needles. May 29, 1948. (1323)

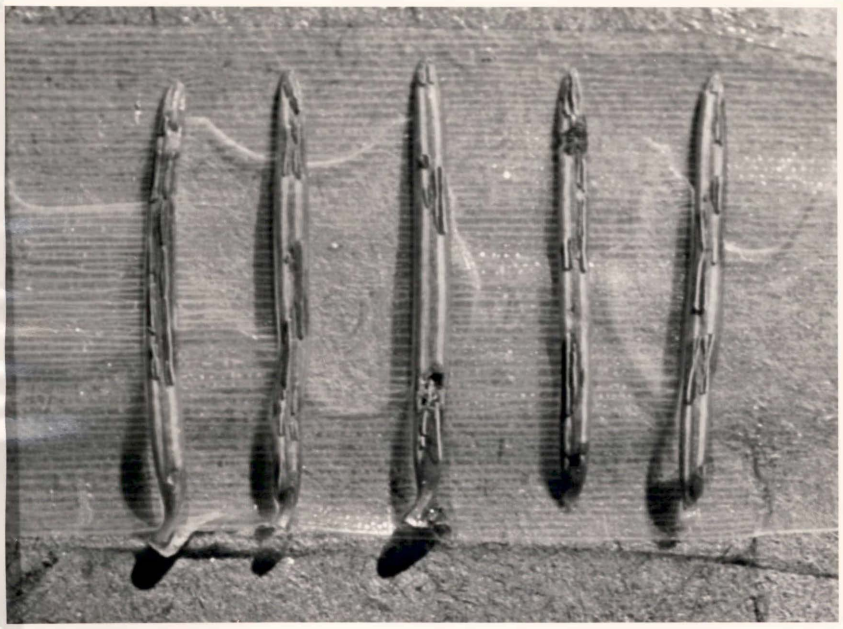


Fig. 3 (above). Fructifications of Rhabdocline pseudotsugae Syd. on 1947 Douglas fir needles. Eureka, Montana, May 29, 1948. (1325)(X2⅛)

Fig. 4 (left). Rhabdocline infected Douglas fir Christmas tree (center) showing fading and some loss of 1947 needles. Uninfected tree to left with normal 1947 foliage. Eureka, Montana, May 28, 1948. (1324)